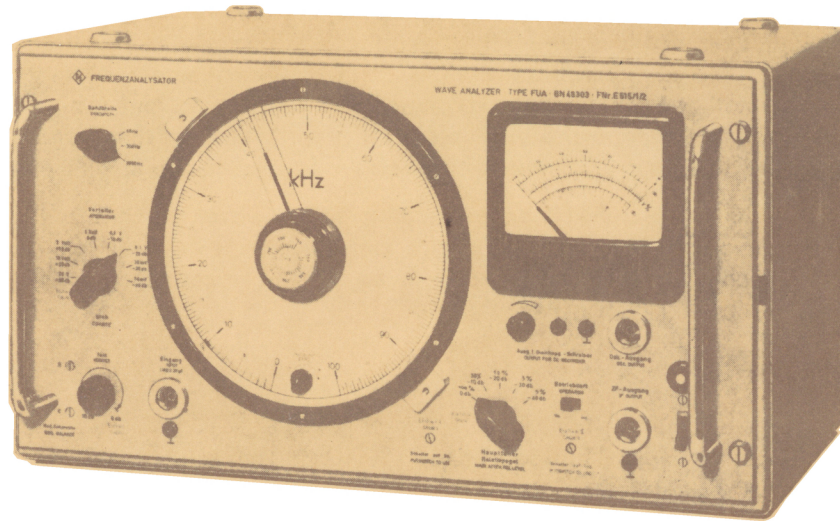


WAVE ANALYZER

100 Hz to 100 kHz



Switch-selected bandwidths

60 Hz 300 Hz 3000 Hz
good skirt selectivity

Very large scale

permits rapid frequency reading

Main and incremental tuning controls

very easy to operate

Logarithmic voltage indication

60-dB range
Amplitude can be read without conversion
No range switching

Linear voltage indication

for relative measurements and absolute voltage measurements
high reading accuracy

The Wave Analyzer Type FUA successively breaks up a complex wave into its spectrum components and measures the amplitude of each frequency. It has all provisions for the accurate and rapid measurement on the most diversified occasions. It is suited as an analyzer for the relative measurement of frequency components and as a selective VTVM for absolute voltage measurements.

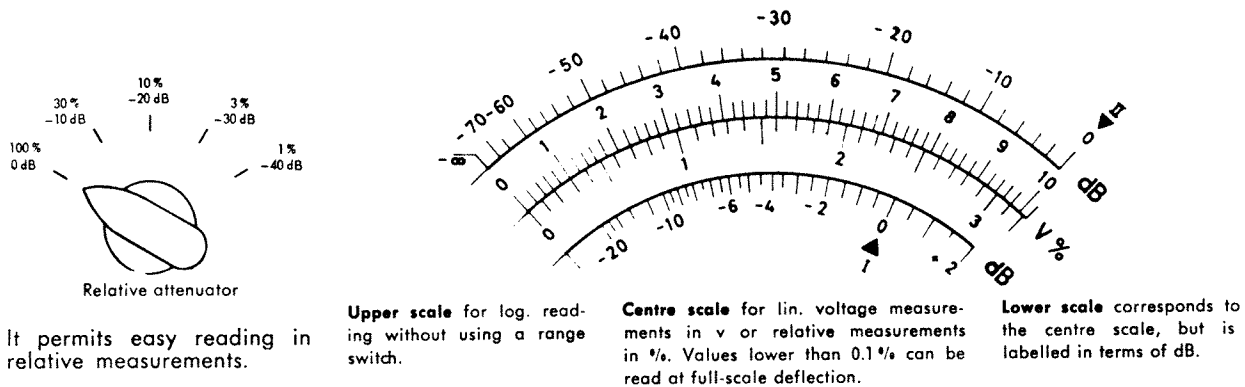
- ▶ In relative measurements, an incremental tuning control permits the reference component to be tuned in for full-scale reading so that the relation to the other components can be directly read on the 60-dB scale in terms of dB or on the linear scale in terms of per cent or one-tenth per cent.
- ▶ High accuracy in absolute voltage measurements is achieved by a long-term stability 10-kHz calibration voltage source used for very rapid calibration and by a flat frequency response, viz. within 1 %.
- ▶ The input impedance of the analyzer remains 1 M Ω for all ranges and allows connection of the Attenuator Probe BN 19129. This probe provides 10 to 1 attenuation and an input impedance of 10 M Ω shunted by 10 pf, rendering possible measurements on high-impedance test items.
- ▶ A DC voltage output for recorders enables a spectrogram to be plotted on a linear scale or on a logarithmic 60-dB scale. The Synchronous Drive BN 483024 and the DC Recorder Type ZSG can be added to obtain an automatically recording test assembly.
- ▶ Intermediate-frequency and oscillator-frequency outputs are provided for special measurements.

Uses

Type FUA finds use in voltage measurements and in the measurement of voltage ratios of several AC voltages of different frequency.

Voltages are measured with an analyzer if only one component of a spectrum is of interest or if a sine wave is so low that hum and noise, etc., render impossible the measurement with a wideband VTVM. A similar case is the adjustment of bridge unbalance voltages to a minimum. The frequency response of noise voltages can be measured if the bandwidth is defined. Measurement of the distortion and of modulation products is another typical application. Engineers developing and testing stereo-coders and stereo-decoders will find Type FUA particularly useful. Of great interest at the moment is the evaluation of pulse spectra especially in pulse programmes of PPM and radar system and in telemetering.

The frequency range of 100 Hz to 100 kHz covers audible sound waves as well as the technically most important supersonic waves. Using pickups for airborne, underwater and structure-borne sound it is possible to plot sound and ultrasound spectra with an assembly consisting of Type FUA and the DC Recorder Type ZSG.



Description

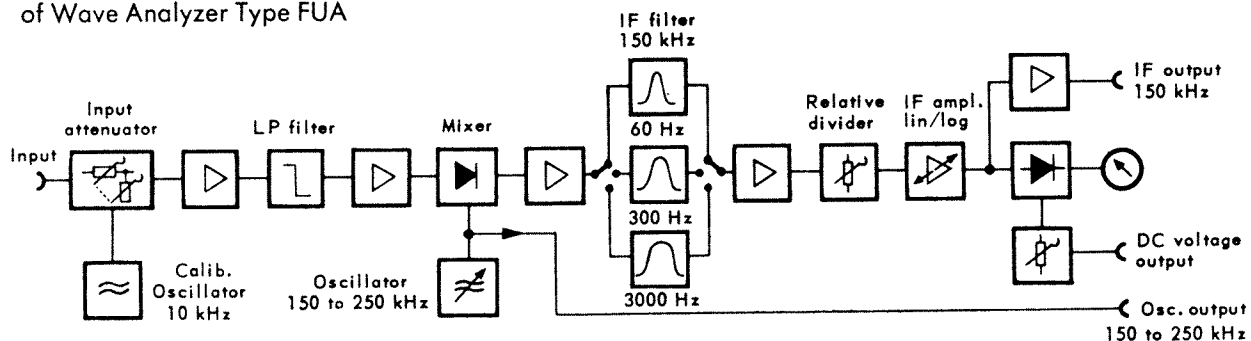
The input signal of Type FUA is mixed with a variable oscillator frequency of 150 to 250 kHz and changed to an intermediate frequency of 150 kHz. An input attenuator prevents overdriving and a low-pass filter following it rejects frequencies exceeding 100 kHz. The set has three IF filters: a crystal filter for 60-Hz, an LC filter for 300-Hz and another for 3-kHz bandwidth. The IF amplifier contains a voltage divider which balances out the voltage difference in relative measurements. This divider is switched out of circuit, if logarithmic indication is desired, and the otherwise linear amplifier following it is switched to AGC operation ensuring that level differences of 60 dB can be read from one scale. The subsequent IF rectifier delivers the DC voltage for the meter.

The rectified IF voltage is brought out for the operation of a recorder. The synchronous frequency sweep is then achieved with the aid of a drive attachment which can be easily secured to the front panel without modifications in the set.

The instrument is housed in a steel cabinet, but may also be used as a rack-mounting unit built to the German standard DIN 41490.

Block diagram

of Wave Analyzer Type FUA



Specifications

Frequency range	100 Hz to 100 kHz
Scale length	580 mm, nearly linear graduation with 1 division per 200 Hz from 0 to 10 kHz 1 division per 500 Hz from 10 to 100 kHz
Interpolation	with incremental dial on slow-motion drive (-750 Hz to +750 Hz)
Calibration accuracy	1% at 10 kHz and higher
Selectivity	I II III
Bandwidth at -3 dB	60 Hz 300 Hz 3 kHz
Detuning at -60 dB	± 300 Hz ± 1000 Hz ± 10 kHz
Linear voltage indication	
Ranges	0 to 0.1/0.3/1/3/10/30/100/300 mv 1/3/10/30 v A 10-dB potentiometer permits full-scale adjustment in relative measurements
Accuracy	$\pm 5\%$ at f.s.d. (incl. error due to attenuator, calibration source and frequency response)
Frequency response	flat within $\pm 1\%$, referred to 10 kHz
Accuracy of the 10-kHz calibration source	$\pm 1\%$ for amplitude $\pm 0.5\%$ for frequency
Logarithmic voltage indication	
Ranges	10 μ v to 10 mv (60 dB) 30 μ v to 30 mv (60 dB) etc. up to 30 mv to 30 v (60 dB) A 10-dB potentiometer permits full-scale adjustment in relative measurements
Accuracy	± 1 dB
Input	adaptable RF socket 4/13 DIN 47284*)
Input impedance	1 M Ω shunted by less than 30 pf, unbalanced, stable over all ranges, suited for Attenuator Probe 10:1 BN 19129 (to be ordered separately)
Suppression of spurious frequencies	
at 150 kHz (IF)	> 80 dB
above 150 kHz	> 60 dB
Inherent noise	< 1 μ v
Inherent distortion	> 70 dB
IF output 150 kHz	adaptable RF socket 4/13 DIN 47284*)
Source e.m.f.	3 v at f.s.d.
Source impedance	500 Ω
Load impedance	> 3 k Ω
Oscillator output terminal 150 to 250 kHz	adaptable RF socket 4/13 DIN 47284*)
Source e.m.f.	1 v
Source impedance	1.5 k Ω , any load permissible
Recorder output terminals	telephone sockets
DC output	0 to -10 v, continuously variable, linear or logarithmic
Load impedance	> 500 k Ω
Automatic frequency sweeping	by Synchronous Drive BN 483024 to be mounted to front panel and coupled to incremental tuning control

*) With the aid of screw-in connectors the user can easily adapt this connector to suit other systems; see data sheet 902 000.

WAVE ANALYZER TYPE FUA

Power supply	115/125/220/235 v $\pm 10\%$, 47 to 63 Hz, 70 va
Valves	2 x E 188 CC 3 x ECC 801 S 2 x EF 800 1 x E 80 CF 2 x EBF 80 1 x EAA 901 S 1 x EF 806 S 1 x EL 86 1 x 85 A 2
Dimensions (W x H x D)	540 x 301 x 378 mm (R&S Standard Cabinet 58)
Weight	approx. 25 kg
Colour	grey, RAL7001
Inscriptions	bilingual: German/English
Designation for ordering	► Wave Analyzer Type FUA BN 48303

Recommended extras

2 RF patch cord, 50 cm, BN 9111407/50 (or 100 cm, BN 9111407/100)

Attenuator Probe BN 19129

Attenuation 10 : 1, input impedance 10 M Ω shunted by 10 pF

DC Recorder Type ZSG BN 18532 or 18532/60

5 ranges, 10 chart speeds. See separate data sheet.

Synchronous Drive for Types FTA and FUA

The Synchronous Drive consists of a change-gear type synchronous motor which is coupled to the tuning control of Type FUA and rotates it at a constant speed. The frequency sweep of Type FUA is then proportional to time. The Synchronous Drive makes the Wave Analyzer Type FUA plus the DC Recorder Type ZSG an automatically recording analyzer. For ordering refer to the following tables:

Order No. of Synchronous Drive	AC supply	Shaft speed	Analyzing time for 100 kHz	Chart length of ZSG	Suited for
► BN 483024/50	220 v / 50 Hz	5.75 rpm	600 sec	20 cm	B = 60 Hz, 300 Hz, 3 kHz, lin. + log.
► BN 483024/60	115 v / 60 Hz	5.75 rpm	600 sec	20 cm	B = 60 Hz, 300 Hz, 3 kHz, lin. + log.

The Gear Box BN 483024/4 forming part of the Synchronous Drive can be replaced. The following Gear Boxes are individually obtainable:

Order No. of Gear Box	AC supply	Shaft speed	Analyzing time for 100 kHz	Chart length of ZSG	Suited for
► BN 483024/1	—	10.35 rph	5 h 33 min	—	Special purposes
► BN 483024/2	—	51.75 rph	1 h 6 min	—	Special purposes
► BN 483024/3	—	103.5 rph	33 min	—	Special purposes
► BN 483024/4	—	5.75 rpm	600 sec	20 cm	B = 60 Hz, 300 Hz, 3 kHz, lin. + log.
► BN 483024/5	—	43.125 rpm	80 sec	40 cm	B = 300 Hz, 3 kHz, lin. + log.
► BN 483024/6	—	17.23 rpm	200 sec	20 cm	B = 300 Hz, 3 kHz, lin. + log.